

Penn Cambria Curriculum

Course Name	High School Pre-Algebra
Length of Course	1 credit – 1 period per day in 18 week block schedule
Grade Level	9
Prerequisites	None
Course Description	This course is an extension of Middle School Pre-Algebra to help students build a solid mathematical foundation before taking Keystone Algebra 1. This course may also be helpful for students who took Middle School Algebra but demonstrated a need for additional foundational math skills before moving to Keystone Algebra 1.
Units of Study	Mathematical Expressions Properties of Real Numbers Solving Linear Equations and Inequalities Graphing Linear Equations Writing Linear Equations Exponents Polynomials & Factoring Collecting, Displaying, and Analyzing Data
Materials	Text: <u>Algebra 1: Concepts and Skills</u> – Larson, Boswell, Kanold and Stiff. Holt McDougal c2010 Supplemental Materials: <u>Larson Algebra 1-</u> Larson, Boswell, Kanold, Stiff-Holt McDougal c2011 <u>Pre-Algebra</u> – Bennett, et al. – Holt Rinehart Winston c2004 Scientific calculator

Unit 1: Mathematical Expressions

Estimated Time: 5 Days

Standard Alignment:

- 2.1.11. A – Use operations (e.g., opposite, reciprocal, absolute value, raising to a power, finding roots, finding logarithms).
- 2.5.11. B – Use symbols, mathematical terminology, standard notation, mathematical rules, graphing and other types of mathematical representations to communicate observations, predictions, concepts, procedures, generalizations, ideas and results.
- 2.5.11. C - Present mathematical procedures and results clearly, systematically, succinctly and correctly.
- 2.8.11. D – Formulate expressions, equations, inequalities, systems of equations, systems of inequalities and matrices to model routine and non-routine problem situations.

Curricular Objectives:

A. Evaluating Expressions:

- a. Evaluate variable expressions involving integers
- b. Evaluate variable expressions involving decimals and fractions
- c. Apply the order of operations

B. Writing Expressions:

- a. Identify the key words that indicate mathematical operations
- b. Translate phrases and sentences into mathematical expressions

Assessments/ Measurement of Objectives:

- Objective tests and quizzes
- Classroom exercises (independent practice)
- Word problems
- Homework exercises

Suggested Methods of Instruction / Learning Activities:

- Lecture
- Drill-and-Practice
- Translate real-world situations into mathematical expressions (e.g., ads from a newspaper)
- Peer Tutoring

Unit 2: Properties of Real Numbers

Estimated Time: 8 Days

Standard Alignment:

- 2.1.11.A - Use operations (e.g., opposite, reciprocal, absolute value, raising to a power, finding roots, finding logarithms).
2.2.11.B – Use estimation to solve problems for which an exact answer is not needed.
2.5.11.C - Present mathematical procedures and results clearly, systematically, succinctly and correctly.

Curricular Objectives:

A. Operations on Real Numbers

- a. Add real numbers
- b. Subtract real numbers
- c. Multiply real numbers
- d. Divide real numbers

B. Applying the Properties of Real Numbers in Variable Expressions

- a. Identify and combine like terms
- b. State the distributive property
- c. Apply the distributive property to simplify expressions

Assessments/ Measurement of Objectives:

- Objective tests and quizzes
- Classroom exercises (independent practice)
- Homework exercises

Suggested Methods of Instruction / Learning Activities:

- Lecture
- Drill-and-Practice
- Computer assisted instruction
- Peer Tutoring

Unit 3: Solving Linear Equations and Inequalities
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Estimated Time: 19 Days

Standard Alignment:

- 2.1.11.A – Use operations (e.g., opposite, reciprocal, absolute value, raising to a power, finding roots, finding logarithms).
- 2.2.11.A – Develop and use computation concepts, operations and procedures with real numbers in problem-solving situations.
- 2.8.11.D – Formulate expressions, equations, inequalities, systems of equations, systems of inequalities and matrices to model routine and non-routine problem situations.

Curricular Objectives:

A. Linear Equations

- a. Solve one and two step equations using addition and subtraction
- b. Solve one and two step equations using multiplication and division
- c. Solve multi-step equations
- d. Solve equations with variables on both sides

B. Word Problems and Formulas

- a. Translate phrases and sentences into mathematical equations
- b. Solve word problems using linear equations
- c. Rewrite equations and formulas in equivalent forms

C. Linear Inequalities

- a. Solve one and two step inequalities
- b. Solve multi-step inequalities
- c. Solve inequalities with variables on both sides
- d. Graph inequalities on a number line
- e. Solve compound inequalities involving “And” and “Or”

Assessments/ Measurement of Objectives:

- Objective tests and quizzes
- Classroom exercises (independent practice)
- Word problems
- Homework exercises
- Open- ended responses

Suggested Methods of Instruction / Learning Activities:

- Lecture
- Drill-and-Practice
- Peer tutoring
- Computer assisted instruction
- Demonstrations of equation-balancing using manipulatives

Unit 4: Graphing Linear Equations
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Estimated Time: 15 Days

Standard Alignment:

- 2.2.11.C – Construct and apply mathematical models, including lines and curves of best fit, to estimate values of related quantities.
- 2.5.11.B - Use symbols, mathematical terminology, standard notation, mathematical rules, graphing and other types of mathematical representations to communicate observations, predictions, concepts, procedures, generalizations, ideas and results.
- 2.8.11.A – Analyze a given set of data for the existence of a pattern and represent the pattern algebraically and graphically.
- 2.8.11.E – Use equations to represent curves (e.g., lines, circles, ellipses, parabolas, hyperbolas).
- 2.8.11.K – Select, justify and apply an appropriate technique to graph a linear function in two variables, including slope-intercept, x- and y- intercepts, graphing by transformations and the use of a graphing calculator.
- 2.8.11.L – Write the equation of a line when given the graph of the line, two points on the line, or the slope of the line and a point on the line.

Curricular Objectives:

A. The Coordinate Plane

- a. Identify the axes and quadrants of a coordinate plane
- b. Plot ordered pairs on a coordinate plane
- c. Graph equations of the form $x=$ and $y=$

B. Slope and Intercepts

- a. Describe the relationship between a graph and its slope
- b. Find the slope of a line given two points on that line
- c. Find the slope of a line given its graph
- d. Find the x and y intercepts of a linear equation

C. Graphing Equations

- a. Graph equations by plotting solutions
- b. Graph equations given a point and a slope
- c. Graph equations by identifying the slope and a point on the line

D. Functions and Relations

- a. Identify functions from tables and sets of ordered pairs
- b. Apply the vertical line test

Assessments/ Measurement of Objectives:

- Objective tests and quizzes
- Classroom exercises (independent practice)
- Homework exercises

Suggested Methods of Instruction / Learning Activities:

- Computer assisted instruction
- Lecture
- Drill and practice
- Computer animation lesson demonstrating the graphing of equations
- Representations of real-world situations as graphs

Unit 5: Writing Linear Equations

Estimated Time: 10 Days

Standard Alignment:

- 2.2.11.C – Construct and apply mathematical models, including lines and curves of best fit, to estimate values of related quantities.
- 2.5.11.B - Use symbols, mathematical terminology, standard notation, mathematical rules, graphing and other types of mathematical representations to communicate observations, predictions, concepts, procedures, generalizations, ideas and results.
- 2.8.11.A – Analyze a given set of data for the existence of a pattern and represent the pattern algebraically and graphically.
- 2.8.11.E – Use equations to represent curves (e.g., lines, circles, ellipses, parabolas, hyperbolas).
- 2.8.11.L – Write the equation of a line when given the graph of the line, two points on the line, or the slope of the line and a point on the line.

Curricular Objectives:**A. Slope-Intercept Form**

- State the slope-intercept form of an equation
- Identify the slope and y-intercept given a linear equation
- Write an equation given a slope and a y-intercept
- Write an equation given a graph
- Represent a real-world situation using an equation in point-slope form

B. Point-Slope form

- State the point-slope form of an equation
- Write an equation given a point on a line and a slope
- Write an equation given two points on a line
- Apply the point-slope form to solve word problems

C. Special Cases

- Write the equation of a vertical line
- Write the equation of a horizontal line

Assessments/ Measurement of Objectives:

- Objective tests and quizzes
- Classroom exercises (independent practice)
- Homework exercises

Suggested Methods of Instruction / Learning Activities:

- Computer assisted instruction
- Lecture
- Drill and practice
- Problem solving activities
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Unit 6: Exponents

Estimated Time: 7 Days

Standard Alignment:

- 2.1.11.A - Use operations (e.g., opposite, reciprocal, absolute value, raising to a power, finding roots, finding logarithms).
- 2.5.11.A – Select and use appropriate mathematical concepts and techniques from different areas of mathematics and apply them to solving non-routine and multi-step problems.
- 2.5.11.B - Use symbols, mathematical terminology, standard notation, mathematical rules, graphing and other types of mathematical representations to communicate observations, predictions, concepts, procedures, generalizations, ideas and results.

Curricular Objectives:

A. Properties of Exponents

- a. Write expressions in exponential form
- b. Evaluate exponential expressions involving integers
- c. Apply exponent properties involving products
- d. Apply exponent properties involving quotients

B. Scientific Notation

- a. Express any value in scientific notation
- b. Translate a number from scientific to standard notation

Assessments/ Measurement of Objectives:

- Objective tests and quizzes
- Classroom exercises (independent practice)
- Word problems
- Homework exercises

Suggested Methods of Instruction / Learning Activities:

- Lecture
- Discovery lesson involving the basic laws of exponents
- Drill and practice
- Computer assisted instruction
- Peer tutoring

<h2>Unit 7: Polynomials & Factoring</h2>

Estimated Time: 14 Days

Standard Alignment:

- 2.1.11.A - Use operations (e.g., opposite, reciprocal, absolute value, raising to a power, finding roots, finding logarithms).

- 2.5.11.A – Select and use appropriate mathematical concepts and techniques from different areas of mathematics and apply them to solving non-routine and multi-step problems.
- 2.5.11.B - Use symbols, mathematical terminology, standard notation, mathematical rules, graphing and other types of mathematical representations to communicate observations, predictions, concepts, procedures, generalizations, ideas and results.

Curricular Objectives:

A. Polynomial Operations

- a. Identify the parts of a polynomial (Terms, coefficients, etc.)
- b. State the degree of a polynomial
- c. Add and subtract polynomials
- d. Apply the distributive property to simplify polynomials
- e. Multiply Polynomials

B. Factoring Polynomials

- a. Identify the greatest common factor of a set of integers and/or monomials
- b. Identify the least common multiple of a set on integers and/or monomials
- c. Factor a polynomial with a common factor
- d. Factor a polynomial of the form $x^2 + bx + c$
- e. Factor special products

Assessments/ Measurement of Objectives:

- Objective tests and quizzes
- Classroom exercises (independent practice)
- Homework exercises
- Open- ended responses

Suggested Methods of Instruction / Learning Activities:

- Lecture
- Drill and practice
- Computer assisted instruction
- Demonstrations of factoring using “Algebra Tiles” manipulatives

<h2>Unit 8: Collecting, Displaying, and Analyzing Data</h2>
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Estimated Time: 6 Days

Standard Alignment:

2.1.11.A - Use operations (e.g., opposite, reciprocal, absolute value, raising to a power, finding roots, finding logarithms).

- 2.6.11.B – Use appropriate technology to organize and analyze data taken from the local community.
- 2.6.11.D - Make predictions using interpolation, extrapolation, regression and estimation using technology to verify them.
- 2.6.11.F – Determine the degree of dependence of two quantities specified by a two-way table.

Curricular Objectives:

A. Measures of Central Tendency

- a. Compute the mean of a distribution
- b. Find the median of a distribution
- c. Find the mode of a distribution
- d. Find the range and quartiles of a distribution

B. Organizing Data

- a. Create a stem-and-leaf plot using given data
- b. Create a box-and-whisker plot using given data
- c. Create a histogram using given data

C. Analyzing Data

- a. Identify the correlation of a data set
- b. Identify misleading graphs
- c. Create and interpret the data in a scatter plot

Assessments/ Measurement of Objectives:

- Objective tests and quizzes
- Classroom exercises (independent practice)
- Word problems
- Homework exercises
- Open- ended responses

Suggested Methods of Instruction / Learning Activities:

- Lecture
- Drill-and-Practice
- Peer Tutoring
- Project based on analyzing real-world data of the students' choice
- Computer assisted instruction